North Zone Roadside Salvage

Rare Plants Report

Prepared by:
Jennifer Costich-Thompson
IPNF- North Zone Botanist

North (Kaniksu) Zone
Idaho Panhandle National Forests

Report Completed: March 10, 2011; Amended February 10, 2012

Table of Contents

Introduction

This report discusses the environmental effects of implementing the North Zone Roadside Salvage (NZRS) Project on threatened, endangered and sensitive plants and Forest species of concern (rare plants). A summary of this report is included as part of the Affected Environment and Environmental Consequences section of the Environmental Assessment (EA.)

Regulatory Framework

Federal legislation, regulations, policy, and direction require protection of species and population viability, evaluation and planning-process consideration of threatened, endangered, and other rare plant species. The regulatory framework for these plants includes the Endangered Species Act (1973) as amended; the National Forest Management Act (NFMA) (1976); the National Environmental Policy Act (1969); Forest Service Manual (2672.1-2672.43); Idaho Panhandle National Forests (IPNF) Forest Plan (1987); and direction from the Regional Watershed, Wildlife, Fisheries and Rare Plants (WWFRP) program and Washington Office.

Analysis Area & Issues

This report addresses the effects of NZRS project activities on rare plants and/or suitable rare plant habitat. The analysis area with respect to rare plants is within the immediate area of proposed activities, where direct or indirect effects could impact rare plants. The "issue indicator" used to assess those effects is the relative amount of canopy opening and/or ground disturbance in and adjacent to documented rare plant populations or suitable habitat within the project area. The issue indicator was determined in part because many rare plants that may occur in the project area have an affinity for closed-canopy forest conditions, the vulnerability of most rare plants to direct effects from ground disturbing activities, and the potential for effects of upland activities on adjacent wetland habitats that support rare plants (see the discussion under Existing Condition below).

Affected Environment- Existing Condition

Methodology

Assessment of rare plants and suitable habitat occurrence was accomplished through review of Idaho Department of Fish and Game Conservation Data Center element occurrence records (IDFG-CDC 2010), National Wetlands Inventory maps, queries of the Forest Service Activity Tracking System (FACTS) database, FSVeg database, Natural Resource Information System (NRIS), aerial photographs, topographical maps, rare plant surveys completed in 2010, previous rare plant surveys completed within the last ten years, personal knowledge and professional judgment of the North Zone Botanist.

Pre-field Review

Pre-field review provides information about the project area that is used to determine the need and extent of field surveys for a project. Pre-field review was conducted in 2009 and 2010. A coarse filter assessment of suitable rare plant habitat within the project area was conducted utilizing data within the FS Veg database and Forest Service Activity Tracking System (FACTS)

database. Aerial photographs, topographical maps, and National Wetlands Inventory maps were also reviewed to identify potentially suitable rare plant habitat.

Rare plants may be assigned to one or more rare plant "habitat guilds." These guilds are artificial groupings based on similar habitat requirements of two or more rare plant species and are used for analysis, as well as coarse filter assessments. Rare plant guilds on the Kaniksu (North) zone of the IPNF are described in the project file and Appendix A of this report, and include aquatic, deciduous riparian, peatland, wet forest, moist forest, dry forest, cold forest and subalpine.

The coarse filter assessment helps to guide rare plant surveys by identifying the areas with the highest potential to support rare plants in the different habitat guilds. Because the query is based in part on habitat type at the stand level, it tends to overestimate the actual amount of suitable habitat that occurs in an area. Conversely, microsites of suitable habitat are not identified by using the query alone. Therefore, review of stand examination plot information, aerial photographs, topographical maps and National Wetlands Inventory maps also help to guide rare plant surveys. Field botanists then use this information to perform "controlled intuitive" surveys of the project area, in which they walk through proposed treatment areas or focus areas to validate the habitat assessments of the coarse filter query. When areas of suitable habitat are confirmed or identified, botanists then intensively survey these areas.

Suitable Rare Plant Habitat in the Project Area

During botanical surveys of the proposed activity area, suitable habitat for rare plants within the "dry forest", "moist forest", "wet forest", and to a limited extent, "cold forest" and "subalpine" habitat guilds was discovered.

No suitable deciduous riparian, aquatic, or peatland habitat was identified within the proposed activity areas during surveys. The coarse filter pre-field assessment identified some peatland habitat guilds within the NZRS project area; however, during field review we found that no proposed activities were actually within the peatland guild.

Previously Documented Rare Plants in the Project Area

Past surveys by Forest Service personnel (ICDC 2009) have documented many rare plant occurrences on National Forest System (NFS) lands within and adjacent to the project area. The following species were known to occur within or in close proximity to the project area before surveys for the NZRS project were conducted:

Moist Forest or Wet Forest Habitat Guild species: *Botrychium lanceolatum* ssp. *lanceolatum, B. minganense, B. pinnatum, Blechnum spicant,* and *Lycopodium dendroideum*. Occurrences of these species are scattered in the project area. Moist forest habitat that could support them occurs within some proposed activity areas.

Dry Forest Habitat Guild species: *Orobanche pinorum.* Occurrences of pine broomrape are scattered throughout dry forest types which intersect proposed NZRS project activities.

Field Survey Results

Rare plant field surveys were conducted for this project in 2010 for those areas which had not been surveyed within the last ten years and exhibited suitable rare plant habitat. Intensive surveys targeted highly suitable habitat identified during the coarse filter assessment within or adjacent to proposed treatment areas. Cursory surveys were then conducted to assess the potential for sensitive plant occurrence and to identify small microsites that could support sensitive plant species in other proposed activity areas with less suitable habitat, as well as within those areas on

NFS lands lacking adequate vegetation data to make pre-field determinations of habitat suitability. All roads proposed for reconstruction or maintenance were also surveyed. Wherever areas of suitable habitat were confirmed or identified, botanists then intensively surveyed these areas, using controlled, intuitive methods.

Surveys of the project area confirmed that no suitable deciduous riparian, peatland, or aquatic habitats for rare plants are present within proposed activity areas. Only microsites of suitable wet forest, cold forest, and subalpine habitats were identified in some proposed activity areas. Several areas within proposed treatment areas were identified as either moist forest habitat, capable of supporting moist forest guild species such as *Botrychium spp.*, *Lycopodium dendroideum*, *Blechnum spicant*, etc. or dry forest habitat, capable of supporting dry forest guild species such as *Cypripedium fasciculatum* or *Orobanche pinorum.*

Newly-Documented Rare Plants in the Project Area

Thirty-two previously undocumented occurrences of rare plants were observed and recorded during botanical surveys for the NZRS project. Six of the plant species are listed by the Regional Forester as "Sensitive," while one species is considered a Forest Species of Concern (FSOC.) Table 1 below summarizes the rare plant findings associated with this project. Some of the rare plants located were not actually within proposed activity areas. Rather, they were located within riparian systems adjacent to proposed activity areas, which will be excluded from activities because they are within the pre-determined Inland Native Fish Strategy (INFS) buffer for the given stream. Many (but not all) of the Lance-leaved moonwort, Mingan moonwort, and Northern moonwort occurrences were located within the existing prism (cut bank, fill slope, or travel surface) of open National Forest System (NFS) roads, many of which are scheduled for maintenance activities associated with this project.

Neither habitat for, nor occurrences of, federally-listed threatened or endangered plant species were discovered during botanical surveys for the NZRS project.

Table 1. Rare Plant Findings within NZRS project area.

Species	**Status**	**State Ranking**	**Number of New Occurrences**
Deerfern (*Blechnum spicant*)	Sensitive	S3-ID	6
Lance-leaved moonwort (*Botrychium lanceolatum ssp. lanceolatum*)	Sensitive	S3-ID	6
Mingan moonwort (*Botrychium minganense*)	Sensitive	S3-ID	7
Stalked moonwort (*Botrychium pedunculosum*)	Sensitive	S1-ID	3
Northern moonwort (*Botrychium pinnatum*)	Sensitive	S2-ID	3
Groundpine (*Lycopodium dendroideum*)	Sensitive	S3-ID	3
Pine broomrape (*Orobanche pinorum*)	Forest Species of Concern	S2-ID	4

Complete results of the botanical field surveys are included in the project file.

Species Screen

The Council on Environmental Quality (40 CFR 1502.2) directs that impacts be discussed in proportion to their significance. Table 2 below displays the level of analysis for rare plants, based upon their potential for occurrence within, or potential for direct effects from, the proposed NZRS project activities.

Table 2. Rare plant species and habitats analyzed.

	No detailed discussion and analysis is necessary for species or habitat not present within the proposed activity areas. Rationale for no further analysis for these species is documented below.	**Supporting rationale is presented in this section for those species and/or habitat present in the overall project area, but not affected by the proposed activities or no action. No detailed discussion or analysis is necessary.**	**Species and/or habitat considered present and potentially affected by the proposed activities or no action are carried forward into a detailed discussion and analysis.**
Federally Listed Species			
Howellia aquatilis	X		
Silene spaldingii	X		
Region 1 Sensitive Species/ IPNF - Forest Species of Concern			
Deciduous riparian guild species		X	
Peatland guild species		X	
Aquatic guild species		X	
Subalpine guild species			X
Cold forest guild species			X
Wet forest guild habitat			X
Moist forest guild habitat			X
Dry forest guild species			X
Botrychium species			X
Blechnum spicant			X
Buxbaumia viridis			X
Lycopodium dendroideum			X
Cypripedium fasciculatum			X
Orobanche pinorum			X

Species or habitat considered present and/or potentially affected by the proposed activities are carried forward into a detailed discussion and analysis in the Environmental Consequences Section.

Threatened and Endangered Plant Species

There are no known occurrences of federally listed threatened or endangered plant species on Idaho Panhandle National Forests (IPNF) lands, although suitable habitat for some threatened species may occur on the Forest. The US Fish and Wildlife Service (USDI 2010) currently lists no Threatened or Endangered plant species as suspected to occur in Bonner or Boundary counties in Idaho, in which the NZRS project area occurs.

Field botanical surveys are routinely conducted for projects on the Kaniksu portion of the IPNF in potentially suitable habitats for water howellia (*Howellia aquatilis*) and Spalding's catchfly (*Silene spaldingii*), both of which are federally listed "Threatened" species, and no occurrences of either species have been documented to date. Activity areas in the NZRS project area were field surveyed in 2009 and 2010, and no potentially suitable habitat for, or occurrences of, threatened or endangered plants were found. Therefore, federally listed plant species will not be discussed further.

Sensitive Species and Forest Species of Concern

Sensitive species are determined by the Regional Forester as those species for which population viability is a concern, as indicated by a current or predicted downward trend in population numbers or habitat capability that would reduce the species' existing distribution. Fifty-six sensitive species are known or suspected to occur in the Kaniksu portion of the IPNF, and suitable habitat for some of these sensitive species occurs within the NZRS project activity area.

In addition, some Forest species of concern (FSOC) which have suitable habitat within the project area are addressed in this analysis. A Forest species of concern is generally not at risk on a rangewide, regionwide, or state level, but may be imperiled within a planning area, such as a National Forest. While biological evaluations are not required to address Forest species of concern, these species are addressed in effects analyses to provide for maintenance of populations as directed in NFMA. A list of all sensitive species and Forest species of concern, known or suspected to occur on the IPNF, is included in the project file.

Approximately 69% of the proposed activity areas associated with the NZRS project were determined (and confirmed with field surveys) to currently provide unsuitable habitat for rare plants. The remaining approximately 31% of NZRS project area with potentially suitable habitat for rare plants is described below, based on associated habitat guild, and further detailed by specific species likely present or suited in those habitats.

Cold Forest and Subalpine Guild Habitat: As determined during field surveys, a limited extent of suitable cold forest and subalpine habitat for rare plants was identified within NZRS activity areas. Approximately three percent (3%) of the proposed activity areas within the NZRS project occur within suitable cold forest or subalpine habitat for rare plants. Therefore, this analysis will consider the effects of the action alternative to this habitat.

Wet Forest Guild Habitat: As determined during field surveys, the only highly suitable wet forest habitat for rare plants was located within INFS buffered wet areas, and has therefore been dropped from proposed salvaging or would be protected by site-specific buffers established by a qualified botanist during project layout (see pages 13-14 for design features/mitigation measures). However, road maintenance activities may impact a small amount of suitable or marginally-suitable wet forest habitat. Approximately one percent (1%) of the proposed activity areas within the NZRS project occurs within suitable wet forest habitat for rare plants. Therefore, this analysis will consider the effects of the action alternative to this habitat.

Moist Forest Guild Habitat: Approximately seventeen percent (17%) of the proposed activity areas within the NZRS project occur within suitable moist forest habitat for rare plants. Therefore this analysis will consider the potential effects of the proposed treatments on moonworts and on habitat for other moist forest guild species.

Deerfern (*Blechnum spicant* (L.) Roth): Deerfern is a long-lived, evergreen fern species which occurs as a Pacific coastal disjunct in northern Idaho. The species is known from approximately 70 populations in Idaho, all of which occur within moist or wet forested communities (USDA 2003.) Deerfern is currently considered globally secure (G5) within its range, and is currently

ranked as S3 (rare or uncommon, but not imperiled) by the Idaho (IDFG-CDC website 2011.) The species is currently classified as sensitive both by the State of Idaho and the R1 Regional Forester.

Six new occurrences of deerfern were documented during botanical surveys for the NZRS project. Therefore, this analysis will consider effects of proposed treatments on document occurrences of this species, as well as suitable habitat.

Rare Moonworts (*Botrychium spp.*): Moonworts are seedless vascular plants that reproduce from spores and underground rhizomes. Western goblin (*Botrychium montanum* Wagner) often occurs with other rare moonworts, usually in wet or moist forest habitat and/or near streams and in soils with well-developed mycorrhizae. Mingan moonwort (*B. minganense* Vict.) and triangle moonwort (*B. lanceolatum* [Gmel.] Angstr.) may also occur with other rare moonworts in or adjacent to wet meadows, open disturbed areas, old roads and roadside ditches. All rare moonworts are small in stature and often inconspicuous; in addition, aboveground stalks may not appear every year.

Because rare moonworts have a broader habitat range than other rare plants, and because they can be overlooked even during thorough floristic surveys, these species have the greatest potential for experiencing impacts from project implementation. Sixteen new occurrences of moonworts ranked as S2 or S3 (rare or uncommon, but not imperiled) species and three new occurrences of stalked moonwort, a S1 (critically imperiled) species were documented during botanical surveys for the NZRS project. Therefore, this analysis will consider the effects of proposed activities on all moonwort species, as well as their suitable habitat.

Groundpine (*Lycopodium dendroideum* Michaux): Occurrences of groundpine were previously documented in the project area, and additional occurrences were identified during field surveys for the NZRS project. Groundpine spreads both by rhizomes and by spores. In the IPNF, this rare clubmoss occurs most frequently in mid-seral, moist, wet or cold forest stands and in the forested edges of wetland habitats. The species is circumboreal and occurs across Canada, southern Alaska and the northern contiguous United States, as well as in Asia. Williams (1990) describes groundpine as a mid-seral species that declines in very old stands; several groundpine populations are documented in second growth or partially logged forests (Penny 1996). Previous monitoring (Penny 1996) and anecdotal observations indicate that groundpine is susceptible to heavy ground disturbance and increased insolation resulting from canopy removal. Fire generally kills the above ground portions as well as rhizomes in the litter layer, but if underground rhizomes survive, the plant may recover after a burn (Chapman and Crowe 1981).

Extensive surveys within suitable habitat for groundpine located three new occurrences of this species. Therefore, this analysis will consider the effects of the proposed treatments on groundpine, as well as suitable habitat for this species.

Green Bug-on-a-Stick Moss (*Buxbaumia viridis* [DC.] Moug. & Nestl.): Although no occurrences of this sensitive species were found during the surveys, some proposed activity areas have marginal potential to support green bug-on-a-stick moss (*Buxbaumia viridis*). This inconspicuous moss usually occurs on soil or well-rotted logs in moist forest habitats to about 4,000 feet elevation (Lawton 1971). It often occurs, and can be confused with, the more common *B. piperi*. *Buxbaumia viridis* is a short-lived, ephemeral species.

Buxbaumia viridis is interruptedly circumboreal in distribution. In western Washington, it is suspected to be fairly common but is often overlooked (Harpel 2002 personal communication). Threats to the species include removal of woody debris that could provide suitable habitat and

destruction of individuals by fire, tree felling and skidding operations. Loss of canopy cover is apparently not considered a threat to the species (Harpel 2002 personal communication).

No occurrences of green bug-on-a-stick moss were documented; however, this analysis will consider the effects of the proposed activities on suitable habitat for this species.

Dry Forest Guild Habitat: Approximately ten percent (10%) of the proposed activity areas within the NZRS project occur within suitable dry forest habitat for rare plants. Therefore, this analysis will consider the potential effects of the proposed treatments on these species and on habitat for other dry forest guild rare species.

Clustered lady's slipper (*Cypripedium fasciculatum* Kell.): This rare orchid occurs in two disparate habitats – moist cedar/hemlock forest and dry Douglas-fir/grand fir forest. Although no occurrences of clustered lady's slipper were observed with the NZRS project area, both potential suitable habitats for the species were observed. Therefore, this analysis will consider the effects of the proposed treatments on suitable habitat for this species.

Clustered lady's-slipper is a rhizomatous, perennial orchid. As in other members of the orchid family, this species requires a symbiotic relationship with fungi in the soil for reproduction and development. It reproduces mainly by seed, but also may increase to a limited extent by rhizome. Because of its dependency on fungal associates, reproduction is typically low. Clustered lady's-slipper requires shade, either from overstory trees and/or shrubs, as well as a sufficient organic layer. The amount of shade and duff necessary to sustain the species has not been established, and probably varies depending on habitat type and other site factors. Natural or management-related disturbances that could affect soil fungi and overstory shade have the potential to impact clustered lady's-slipper survival. Disturbances of primary concern include fire, various types of timber harvest, thinning, and ground disturbance associated with these activities (Lichthardt 2003). Observers generally agree that the rhizome of Clustered lady's-slipper is shallow (1-5 inches below the mineral soil surface) but differ as to how much protection this affords (Lichthardt 2003).

Pine broomrape (*Orobanche pinorum* Geyer): Pine broomrape is a non-chlorophyllous member of the family Orobanchaceae. While once believed to be parasitic on the roots of various conifers (Hitchcock et al. 1959), recent research (Ellis et al. 1999) and anecdotal field observations suggest instead that the exclusive host plant is oceanspray (*Holodiscus* spp., in particular *Holodiscus discolor* [Pursh] Maxim.) and is often associated with *Armillaria ostoyae* – infected forest stands. Pine broomrape is endemic to western North America, where it occurs in scattered locations from northern California through Oregon, and in central and northeastern Washington and extreme north Idaho. It is found in mesic to dry grand fir and Douglas-fir habitats. Little is known about the species' ecology or the mechanism of parasitism between it and its host. Although many of the activity areas within the NZRS project area contain suitable habitat for this species, extensive surveys revealed only three small populations and one large meta-population, all of which occurred within Douglas-fir/grand fir forest stands infected with *Armillaria.* Therefore, this analysis will consider the effects of the proposed treatments on pine broomrape, as well as suitable habitat for this species.

Other Rare Plant Guild Habitats: Three other habitat guilds which occur within the project area (aquatic, peatland, and deciduous riparian), as well as their associated rare plant species, would not be impacted by the proposed activities because the activities would not occur within the species' habitat or microsites of habitat, as prescribed in project design features. No activities would occur near aquatic habitats. All named and unnamed aquatic features will be buffered utilizing the appropriate Riparian Habitat Conservation Area (RHCA) buffer as a minimum (see Hydrology Report and "Design Features" on pages 13-14). Microsites of deciduous riparian

habitat within the overall project area also occur within sites like RHCAs, which will be buffered from all activities. Other, smaller peatlands would be protected according to guidelines in the Conservation Strategy for Idaho Panhandle Peatlands (Lichthardt 2004).

Proposed activities will not occur within aquatic, peatland, or deciduous riparian habitat guilds; therefore none of these guilds would incur ground disturbance or changes to forest canopy cover. As a result, the proposed activities will result in no direct, indirect, or cumulative effects to aquatic, peatland, or deciduous riparian habitat guilds, or their associated rare plant species. Therefore, these guilds and associated species will be dismissed from further analysis and discussion.

Environmental Consequences

Methodology

Analysis was conducted based on the results of rare plant surveys, current population condition and distribution of rare plants in the project area, proposed activities and the likely effects of those activities on existing rare plant populations and habitat, current scientific literature, and professional judgment of the project botanist.

The issue indicator for analysis of direct or indirect effects to sensitive and rare plants is the relative amount of canopy opening and/or ground disturbance in and adjacent to documented rare plant occurrences and/or suitable rare plant habitat. The issue indicator was determined based on the affinity of moist forest moonworts for relatively closed-canopy conditions (IDFG-CDC 2010) and their dependence on soil mycorrhizae, which may be destroyed during ground-disturbing activities. However, certain species of moonworts can also withstand moderate levels of disturbance and changes in available light (Evans and Associates 2005b.) Canopy removal and disruption of soil mycorrhizae are also a concern for clustered lady's slipper, as is disruption of natural fire regimes in its Douglas-fir/ninebark habitat. Extensive canopy removal and soil disturbance upland of peatland habitats may contribute to a change in nutrient composition and hydrology of the peatlands, which in turn may have negative impacts on rare plants (Bursik and Moseley 1992, Lichthardt 2004).

For analysis of proposed roadside salvage treatments and associated road maintenance work, the cumulative effects area for rare plants is often a result of direct effects to existing occurrences and of the overall function of the population within a given geographic area. The population size depends upon the species, usually at the largest, an individual watershed; often populations occur within a 100 square foot area. The suitable habitat for each species within areas proposed for treatments represents the likely limit of effects to rare plant populations from implementation of the action alternative. Those limits are largely based on the expected distance of spore or seed dispersal and potential for colonization of rare plant populations in areas of suitable habitat. While patterns of dispersal are not known with certainty for many plant species, in studies of *Botrychium virginianum* most spores fell within three meters of the source plant (Peck et al. 1990). Other sensitive species' seeds heavier than *Botrychium* spores might be assumed to have similar, if not more restricted, dispersal patterns.

For the same reasons, cumulative effects analysis considers not only areas proposed for timber salvage and slash management activities, but also the areas proposed for ground disturbance as part of proposed road maintenance activities associated with the NZRS project.

Cumulative effects to rare plant species and suitable habitat from proposed activities are generally described as very low, low, moderate or high, with the following definitions:

- ***very low*** = no measurable effect on individuals, populations or habitat
- ***low*** = individuals, populations and/or habitat not likely affected
- ***moderate*** = individuals and/or habitat may be affected, but populations would not be affected, and habitat capability would not over the long term be reduced below a level which could support sensitive plant species
- ***high*** = populations would likely be affected and/or habitat capability may over the long term be reduced below a level which could support sensitive plant species

For effects to individual threatened, endangered, or sensitive plant species as a result of the NZRS proposed activities, please see the determination of effects as expressed in the Biological Evaluation and Biological Assessment.

The following table 3 displays the risks of direct or indirect effects to rare plants resulting from proposed activities. The risk levels to rare plants as described were used in evaluating the environmental consequences from the proposed activities.

Table 3. Effects of Proposed Activities on Rare Plants.

Proposed Activity or Event	Rare Plant Guild and/or Species Potentially Affected	Risk of Adverse Impacts to Rare Plant Occurrences (*Without Mitigation*)	Risk of Adverse Impacts to Rare Plant Occurrences (*With Mitigation*)
Roadside Timber Salvage (*For this project, salvage consists of individual dead tree salvage (standing or down) within 200 feet of the road prisms, as feasible without equipment leaving road prisms; logs would be cable- yarded, winched, and/or directionally-felled to the road within reach of equipment. The salvage/removal of dead standing or down trees, and/or hazard trees, will likely result in an insignificant change to forest canopy. Although equipment would be kept on road prisms, thereby reducing off-road soil disturbance in potential rare plant habitats, some soil rutting or displacement could occur during cabling/winching of salvage material to the road prism.)*	Dry Forest Habitat (Includes habitat for *Cypripedium fasciculatum* – *CYPFAS* or *Orobanche pinorum-OROPIN*)	Very low to Low	Very low to Low
	Moist, Wet, Cold Forest, or Subalpine Habitat	Low to Moderate	Very low to Low
Road Reconditioning/Maintenance (*For this project, road maintenance activities will likely include brushing, blading, re-shaping of prism, ditch-clearing/ pulling, drainage repairs, spot graveling, etc.. All of these activities result in potential minor changes to forest canopy directly over the road prism, and usually blading and prism work result in significant soil disturbance. However, all of the disturbance would occur within existing, open- road prisms, which have already been significantly altered from natural or historic conditions. The conditions on road prisms, although sometimes capable of supporting certain rare plant species, are frequently undergoing disturbance, due to public use and maintenance activities, and are therefore usually considered unsuitable or low quality habitat for rare plants. However, when a species occurs within a road prism adjacent to good quality habitat and when occurrence numbers of the species classify it as 'critically imperiled', additional special protection features or mitigation measures may be warranted.*)	Dry Forest Habitat (Includes habitat for *CYPFAS* and *OROPIN*)	Moderate	Low to Moderate
	Moist, Wet, Cold Forest, or Subalpine Habitat	Moderate to High	Low to Moderate
	Botrychium pedunculosum	High	Moderate
Biomass Utilization within Road Prism (*For this project, utilization activities would include biomass- chip, pulp, hewwood, hogfuel, sawtimber, etc.- utilization of any feasible woody materials typically chipped or cut during road maintenance activities. These materials can already be cut, as per Forest Service road maintenance direction; however, this project proposes removing and utilizing these materials whenever feasible. Typical materials removed would be small, sapling or pole size trees and/or woody shrubs which would be sawed or brushed off of the road travelway, cut slope, and fill slope.)*	All rare plant habitats and associated species	Very low to Low	Very Low

The following past, current, ongoing and reasonably foreseeable events within the project area were analyzed, with respect to the cumulative effects analysis for rare plants, when direct or indirect effects were confirmed:

Table 4. Past, Present, and Reasonably Foreseeable Actions

Action	Past	Present	Reasonably Foreseeable	May have cumulative effects	Explanation
Timber harvest	X	X	X	Yes	Timber harvest often affects a primary issue indicator- changes in canopy coverage- for rare plants. Such activities would likely result in ***low to moderate*** cumulative effects on rare plants.
Prescribed burning for site prep and fuels treatment	X			Yes	Prescribed burning can affect both issue indicators- changes in canopy cover and soil/ ground disturbance – for rare plants. Such activities would likely result in ***low to moderate*** cumulative effects on rare plants.
Tree planting	X			Yes	On a very small scale, tree planting can cause soil disturbance, and therefore may have an effect on individual rare plants. Such activities would therefore result in a ***very low*** cumulative effect on rare plants.
Public activities: firewood cutting, driving roads, camping, snowmobiling, hunting, hiking, berry picking	X	X	X	Yes	Again, on a very small scale, some public activities have the capacity to result in confined areas of soil disturbance or changes in canopy coverage (i.e. cutting/skidding firewood trees). Such activities likely result in a ***very low to low*** cumulative effect on rare plants.
Road construction	X	X		Yes	Road construction can affect rare plants due to the intrinsic nature of road construction, which entails soil disturbance/ displacement, as well as some minor changes in canopy cover. New road construction activities may have a ***low to moderate*** cumulative effect on rare plants.
Road decommission	X			Yes	Same as for “road construction.”
Road maintenance	X	X	X	Yes	Road maintenance can have the same potential effects on rare plants as road construction/ decommission, except that the disturbance is on a much reduced scale and the site is already disturbed by the presence of the road anyway. Such activities would have a ***low to moderate*** cumulative effect on rare plants.

Action	Past	Present	Reasonably Foreseeable	May have cumulative effects	Explanation
Fire suppression	X	X	X	Yes	Some fire suppression activities (such as fireline construction and back-burning) have the capacity to impact rare plants, predominantly through soil disturbance. Such impacts would have a ***very low*** cumulative effect on rare plants.
Wildfires	X		Unknown	Yes	Wildfires can have the same affects to rare plant issue indicators as prescribed burning—changes to canopy cover, as well as soil disturbance. However, because fire suppression (described above) and future wildfires have the cumulative effect of potentially increasing future wildfire intensity, the probability of severely disturbed soils (which could take substantial length of time to recover) is increased with future wildfires. Therefore, cumulative effects to rare plants as a result of wildfires can vary widely, from ***low to high***.
Trail construction	X			Yes	Trail construction can have some effect on rare plants through soil disturbance and displacement. However, because the scale is so limited, impacts would typically only affect individual rare plants or small sub-populations. Therefore, the cumulative effect on rare plants would be ***low***.
Trail maintenance	X	X	X	Yes	Again, although there is some possibility of soil disturbance through trail maintenance activities, the scale of impacts to rare plants is very small. Therefore, the cumulative effect on rare plants is ***very low***.
Pre-commercial timber stand improvement	X		X	Yes	Pre-commercial timber stand improvement activities involve pruning and thinning young, sapling-size trees prior to canopy closure. As such, these activities have the effect of lengthening the time a stand will take to reach canopy closure, which can create the shade needed by *some* moist habitat rare plant species. Therefore, the cumulative effect on rare plants would be ***very low to low***.

Action	Past	Present	Reasonably Foreseeable	May have cumulative effects	Explanation
Spraying herbicides to control and prevent noxious weeds under the Sandpoint Noxious Weeds EIS, Priest Lake Noxious Weeds EIS, and the Bonners Ferry Noxious Weed Control Project EIS	X	X	X	Yes	The use of herbicides, as directed under each of the District's noxious weed control EIS, is varied throughout the NZRS project area. Key rare plant occurrences are generally buffered from herbicide treatments, but because noxious weed control typically also kills most broadleaf plants, there is a potential for individual rare plants to be directly impacted by spraying. However, due to the spray locations being associated with roads, which have already previously been disturbed and have low suitability for rare plants, the potential for rare plants to be cumulatively impacted by herbicide use or other noxious weed control is ***very low to low***.
Clearing brush and trees to maintain heli-spots	X	X	X	Yes	Clearing brush/trees for heli-spots does impact canopy cover and even occasionally creates soil disturbance in very confined areas, so any potential impacts to rare plants would be ***very low*** and would likely only impact individual plants or small sub-populations.
East Fork Meadow EA: project is in planning phase; Approximately 1,520 acres of timber harvest and prescribed burning activities are proposed on the Bonners Ferry Ranger District.			X	Yes	There are a few segments of road within the NZRS project area that are also included in the East Fork Meadow Creek (EFMC) project area, which is primarily a hazardous fuels treatment project. Therefore, there is a potential that some activities associated with the EFMC project could impact rare plants in the NZRS project area by modifying canopy cover. However, because the EFMC project proposal is more impactive to rare plants than the NZRS, the potential for cumulative effects of the two projects is ***low***.

Action	Past	Present	Reasonably Foreseeable	May have cumulative effects	Explanation
Leonia EA: project is in planning phase; Approximately 700 acres of timber harvest and prescribed burning treatments are proposed on the Bonners Ferry Ranger District.			X	Yes	There are a few segments of road within the NZRS project area that are also included in the Leonia project area, which is primarily a hazardous fuels treatment project. Therefore, there is a potential that some activities associated with the Leonia project could impact rare plants in the NZRS project area by modifying canopy cover. However, because the Leonia project proposal is more impactive to rare plants than the NZRS, the potential for cumulative effects of the two projects is ***low***.
Residential development on private lands	X	X	X	Yes	The level of impact that past, ongoing, and future land development has on rare plants is difficult to quantify. However, most land development involves soil disturbance through road construction and building activities, and occasionally also involves changing forest canopy cover. Historically, many land developments were established near water, which also tends to be suitable habitat for many rare plant species, including moist and wet forest, peatland, and aquatic habitat guild rare species. Such impacts would generally be considered localized; however, due to the number and "permanency" of the impacts resulting from development, cumulative effects to rare plants resulting from such activities are likely ***low to moderate***.

The period for measuring short-term cumulative effects to rare plants and suitable rare plants habitat is ten years following completion of harvest and other restoration projects, or, in the event of selection of the No Action alternative, ten years after the date of signing the Decision Notice. Beyond ten years, the likelihood of events or activities affecting rare plants and suitable habitat would be difficult to predict.

Design Features

The following design features (see "Design Features" in Environmental Assessment) would be implemented with any action alternative to protect documented rare plant populations and highly suitable habitat adjacent to proposed treatment units:

1. All documented rare plant occurrences would be evaluated by the project botanist and where warranted, mitigation measures will be implemented to protect population

viability. (Some occurrences of rare plants found on or immediately adjacent to open system roads may not be buffered, and buffering will occur on a case-by-case basis when it is determined to be necessary to maintain population viability of a species.)

2. Occurrences of stalked moonwort (*Botrychium pedunculosum*), even where it occurs within a road prism, will be buffered from all project-related activities (even road maintenance), except where to do so would jeopardize public safety. These protections are necessary to maintain genetic breeding stock adjacent to suitable habitat for an otherwise critically-imperiled species.
3. Microsites of highly suitable rare plants habitat that occur within proposed treatment units, including seeps, springs and other seasonally or perennially wet areas, would be protected from all project activities by site-specific buffers established by a qualified botanist.
4. Where roadside salvage activities occur within wet or moist forest habitat types (particularly along FSR 659, 1094, 313, and 638), leave a minimum of one blown-down cedar tree (>12" dbh) for every tenth-mile of salvage, if available, to provide for rare plant habitat.
5. Although not required, where feasible within moist and wet forest guild habitat, road maintenance activities will be avoided between June 15 and August 30, to allow moonwort populations ample time to emerge and reproduce prior to disturbance.
6. Any changes to the proposed action that may occur during layout would be reviewed by a qualified botanist, and rare plant surveys would be conducted as necessary prior to project implementation. Newly documented occurrences would be evaluated, with specific protection measures implemented to protect population viability. Such measures could include the following:

    - Dropping units from harvest activity;
    - Modifying unit boundaries to provide adequate buffers around documented occurrences, as determined by a qualified botanist and based on topography, extent of contiguous suitable habitat for documented occurrences and the type of treatment proposed;
    - Modifying harvest methods, fuels treatment or logging systems to protect rare plants and their habitats; and/or
    - Implementing, if necessary, Timber Sale Contract provisions B6.24, Protection Measures Needed for Plants, Animals, Cultural Resources, and Cave Resources; C6.24#- Site Specific Special Protection Measures; and B8.33, Contract Suspension and Modification.

Estimated Effectiveness: Moderate to High; the above measures would assure protection of the documented occurrences of sensitive species when necessary to protect population viability (i.e. Stalked Moonwort.) Although some individual sensitive species within and adjacent to open road prisms would not be buffered from project activities, each occurrence was considered as to importance for population viability of the species. Most of the highly suitable wet forest rare plant habitat will also be protected through incorporation of INFS or RHCA buffers.

Required Monitoring

In addition to the above design features, monitoring of project activities is also required.

IPNF Forest Plan Monitoring

IPNF direction is to inventory and manage sensitive plants so that no new species have to be listed as threatened or endangered. Current monitoring related to rare plants can be found in the 2007-2009 IPNF Forest Plan Monitoring and Evaluation Report (USDA 2010.) Suitable sensitive plant habitat in project areas is surveyed and projects modified as necessary to achieve this objective. Sensitive plants are protected according to site-specific management plans developed by Forest and Zone Botanists.

Project Monitoring

Monitoring of rare plant populations where the proposed activity was modified by buffering rare plant individuals, populations, or habitats to avoid adverse effects would be conducted by qualified Botanists to validate the effectiveness of design features and mitigation measures during and following the activity.

Additionally, as funding allows, botanists will perform monitoring of population trends for some sensitive species which were documented within road prisms. Some of these roadside occurrences will not be buffered from project activities, and monitoring may help us better understand how certain species (particularly moonworts) respond to different disturbance levels related to road maintenance activities.

Effects Common to Alternative 1 (No Action), Alternative 2 (Preferred Alternative), Alternative 3 (No Roadside Salvage, but Road Maintenance with Utilization), and Alternative 4 (Roadside Salvage, but only limited Utilization with Road Maintenance)

This section describes the predicted effects to rare plants common to all three alternatives for the NZRS project, including Alternative 1 (No Action), Alternative 2 (Preferred Alternative), Alternative 3 (No Roadside Salvage), and Alternative 4 (Roadside Salvage, but with limited Utilization.)

Direct and Indirect Effects

Threatened and Endangered Species

No endangered plant species are suspected to occur in the IPNF, and no threatened plant species are suspected to occur in Bonner or Boundary counties of Idaho (USDI 2010). Furthermore, activity areas in the NZRS project were field surveyed in 2009 and 2010, and no potentially suitable habitat for, or occurrences of, threatened or endangered plants were found. Therefore, this project would produce no direct or indirect effects to any federally listed plant species.

Cumulative Effects

Threatened and Endangered Species

Because no direct or indirect effects would occur to any federally listed species (see above), there would be no cumulative effects to populations or suitable habitat for federally listed species from implementation of any of the three alternatives.

Effects Specific to Alternative 1 - Road Maintenance with Limited Utilization, No Roadside Salvage (No Action Alternative)

Under the No Action alternative, current management plans would continue to guide management within the project area. Road maintenance work would continue under current policy that does not allow for utilizing forest products resulting from cutting or chopping roadside vegetation, except for portions of trees that may have naturally fallen on road surfaces. Commercial roadside salvage activities of dead standing, down and hazard trees would not be authorized under this alternative. Salvage activities would have to be authorized under separate and multiple NEPA decisions in the future.

This section describes predicted effects to rare plants from implementation of no action that differ from effects expected resulting from action alternatives.

Direct, Indirect, and Cumulative Effects

Sensitive Plants and Forest Species of Concern

Management activities would not change from current levels, and current vegetation trends would be expected to continue. Direct effects to some rare plant species in the project area would continue to occur from implementation of the "no action alternative." Those species which prefer moist forest habitat and can tolerate compacted soils, light to moderate disturbance, and some sunlight (for example, *Botrychium minganense, B. lanceolatum*, and *B. pinnatum*) will continue to incur some negative effects to individuals as a result of existing road maintenance activities already directed under Forest Service management. Other species, which likely incidentally occur adjacent to or within road prisms (i.e. *Botrychium pedunculosum*) have the potential to incur even more detrimental effects resulting from road maintenance activities, due primarily to their low occurrence numbers.

Individual, broad-leaved rare plants occurring on road prisms within any habitat guild could also be directly affected by ongoing noxious weed control measures (as prescribed by each District's Noxious Weed management policy), which often include broad-leaf herbicide applications. Indirectly, some rare plant individuals could also be adversely impacted through noxious weed introduction or spread and the resultant competition with weeds.

Determination of Cumulative Effects Resulting from Alternative 1 (No Action Alternative)

Sensitive Plants and Forest Species of Concern

When combined with and considering the above past, present, and reasonably foreseeable activities, as well as the Design Features described on pages 14 and 15 of this document, Alternative 2 would have ***low to moderate*** cumulative effects to rare plants and/or suitable habitat within the moist forest, wet forest, dry forest, cold forest, and subalpine habitat guilds.

Effects Specific to Alternative 2— Road Maintenance with Utilization and Roadside Salvage (The Preferred Alternative)

Alternative 2 is the proposed action and is detailed on page 3-4 of the NZRS EA.

The project area includes specific road segments located on National Forest System (NFS) lands, managed by the Bonners Ferry, Sandpoint, Priest Lake, and Coeur d'Alene River Ranger Districts and the Priest River Experimental Forest of the Idaho Panhandle National Forests, within Bonner,

Boundary and Kootenai counties of Idaho. The preferred alternative proposes: 1) conducting roadside salvage of dead, down, and hazard trees along about 430 miles of specifically listed and currently open, road segments; 2) conducting road maintenance activities, including shoulder vegetative clearing along approximately 632 miles of open road segments, 430 miles of which are also designated as roadside salvage areas (described above); and 3) utilizing woody materials created through road maintenance/clearing activities, as much as is feasible. All activities are expected to take place over an approximate five year period.

Roadside salvage of dead standing, down and live hazard trees will occur within 200 feet from road shoulders of open road segments identified by the purpose and need, if not otherwise excluded by the project design criteria (see Mitigation section on page 10 of the NZRS EA). During the process of roadside salvage, no tracked/wheeled equipment will leave the road prisms to procure the salvage material. Forest products that are a by-product of road maintenance treatments would be available for utilization.

This alternative would be the most effective in meeting the project purpose and need when compared to any of the other alternatives being considered because it combines road maintenance treatments with roadside salvage opportunities, would provide the most jobs and utilize the highest quantity of forest products.

This section describes the predicted effects to rare plants specifically resulting from implementation of Alternative 2.

Direct and Indirect Effects

Sensitive Plants and Forest Species of Concern

Within Alternative 2 proposed activities, most of the moist forest habitat identified in the coarse filter assessment and during surveys tended to have marginal to moderate potential to support rare plants (specifically *Botrychium spp.*). However, some highly suitable moist habitat within proposed roadside salvage activity areas does exist, and either individual rare plants or their habitat may incur direct effects of soil displacement through the action of winching or pulling logs to the roads.

Many of the rare plant occurrences found during surveys for the project are in fact within the road prisms (cut bank, fill slope, or travelway) proposed for road maintenance activities. Even when roads intersect otherwise suitable habitat for rare plants, the roads themselves are not considered highly suitable habitat. Rather, due to the already degraded conditions and potential for recurring disturbance caused by road use and maintenance, road prisms are considered unsuitable or only marginally-suitable for rare plants. Most rare plant occurrences found within the road prism occur on the cut slope, ditchline, or shoulder of the roads. The primary species observed within road prisms during surveys for the NZRS project include *Blechnum spicant* **(deer fern)**, *Botrychium lanceolatum* **(lance-leaved or triangle moonwort)** and *B. minganense* **(Mingan moonwort)**, all three of which are listed as S3 sensitive species in the state of Idaho. An S3 ranking means that the plant is considered "uncommon or rare, but not imperiled" (IDFG-CDC 2011.)

In the case of deerfern, the road cutbanks often have intersected subsurface water, creating small seeps and human-created habitat for this coastal disjunct species. Of the six new deerfern occurrences documented during surveys for this project, three occurrences exist within small ephemeral or perennial streams, which will be buffered from project activities. The remaining three occurrences exist either on cutbanks or within the drainage ditches of roads proposed for maintenance activities. Although road brushing and blading would likely not significantly impact

these three occurrences, if the road segments in these areas were to require ditch pulling or more substantial repairs, these occurrences have the potential to be significantly affected. Therefore, the project botanist considered whether or not the three occurrences adjacent to roads contribute substantially to the overall population viability of the species.

In the case of all three deerfern occurrences adjacent to roads, deerfern populations also occur outside of the road prism elsewhere in the drainage. Therefore, deerfern spores and genetic material are available nearby the roadside populations to contribute more uninterrupted and substantial viability to the overall deerfern population in the larger Priest Lake watershed. Furthermore, anecdotal evidence shows that deerfern often tolerates moderate levels of disturbance (USDA 2003), and therefore these roadside occurrences could perhaps survive road maintenance activities associated with this project. As a result, it was determined these three roadside occurrences of deerfern are not contributing substantially to overall population viability of the species, and so where road and public safety are a priority, these three occurrences will not necessarily be buffered from project activities.

Past research on the Idaho Panhandle National Forests (IPNF) has shown that both lance-leaved and Mingan moonworts favor moist soils and can tolerate light to moderate disturbance and more open canopies (sun exposure) than many other moonwort species (Evans and Associates 2005b). Therefore, it is not uncommon to find lance-leaved and Mingan moonworts on road prisms within our moist or wet forest habitat guilds. A few individuals of *B. pinnatum* **(northern moonwort)** and *Lycopodium dendroideum* **(ground pine)** also were documented in similar habitats within road prisms during surveys for the NZRS project, and both species are currently listed as S2 species in the state of Idaho. In the cases of these two species, individuals were also found outside of the road prism and the localized populations were considered fairly stable. Where these five species occur on road prisms, individuals will not be buffered from road maintenance activities because for each species, the population viability was not dependent upon the roadside occurrences. Therefore, NZRS project activities may directly or indirectly affect individuals of these species, as well as marginally-suitable habitat, and may result in low to moderate effects to these species.

Two small populations of *Botrychium pedunculosum* **(stalked moonwort)** were also located within road prisms during surveys for this project. Stalked moonwort is classified as an S1 species in the state of Idaho, indicating the species occurs in five or fewer known populations in the state and may be critically imperiled. As a result, these occurrences will be buffered from all project activities (except where to do so would jeopardize public safety.) By protecting these known occurrences, especially where they occur adjacent to suitable habitat off of the road prism, the individuals may continue to provide a source of breeding stock and genetic diversity, which will help promote population maintenance or expansion. Therefore, site-specific buffering will help to reduce the direct and indirect effects of the proposed activity on the stalked moonwort.

No occurrences of **clustered lady's slipper** (*Cypripedium fasciculatum*) were found in any proposed activity areas, however some suitable habitat for this species was identified. Therefore, roadside salvage and road maintenance activities have the potential to cause some direct and potentially indirect impacts to both individual clustered lady's slippers that were not detected during botanical surveys, as well as their habitat. The degree of effects are largely unknown, however, soil disturbance (caused by winching trees/logs or road maintenance) would likely result in the greatest potential for negative effects to this species.

Although suitable dry forest habitat occurs scattered throughout the NZRS project area, no sensitive species that occur within the dry forest habitat guild were located. Four new occurrences of *Orobanche pinorum* **(pine broomrape)** were located during surveys for this project, one meta-population of which was quite extensive and encompassed several dozen individuals. Pine

broomrape is currently classified as an S2 species in Idaho, but is not currently considered sensitive by the Regional Forester due to its broad global range and distribution. The IPNF currently tracks this species, as a Forest Species of Concern (FSOC), within the dry forest habitat guild. The impacts of the proposed treatments to suitable habitat for this species cannot be predicted with certainty because the species' ecology is poorly understood. However, the proposed treatments would likely result in scattered, dispersed, soil displacement (due to winching of logs to the road prism), as well as small decreases in forest canopy cover as individual trees or snags are felled. Such low levels of disturbance may actually enhance oceanspray, which is the preferred host species for pine broomrape. Oceanspray is considered to be well adapted to disturbance by fire, usually responding to a low-intensity burn by root crown and rhizome sprouting (Young 1983). All of these new pine broomrape occurrences were found outside of the road prism, within areas proposed for salvage of dead trees or logs and live, hazard trees. Because the expected level of disturbance resulting from the proposed salvage activities is dispersed and considered to be low, site-specific buffers around individual pine broomrape ramets will not be imposed.

Alternative 2 may have the potential indirect effect of increasing noxious weed spread, primarily along and adjacent to roads. The extent and degree of potential weed spread is difficult to quantify; however, the NZRS Weeds Report discloses the expected effects of the project on noxious weeds. Noxious weed spread can indirectly affect some rare plants by infesting and/or dominating suitable habitat, particularly of dry forest habitats (which tend to have more open forest canopies and are more conducive to noxious weed establishment and growth.) Effects resulting from noxious weed infestation in suitable habitat for moist or wet forest rare plant species would be expected to be short-term, until forest canopy cover begins to recover/increase following proposed treatments. When forest canopy cover recovers (to approximately 40-50%, based on personal observation), weeds have less competitive advantage and begin to subside in a forest stand.

Due to the potential for the project activities (such as roadside salvage and road maintenance) to indirectly increase weed spread, the NZRS Weed Report also describes required “Mitigation Measures” to reduce noxious weed infestations and spread. Some mitigation measures include reducing the potential for new weed infestations (through pre-treatment of equipment, roads, and road construction materials), monitoring treatment areas, and reducing existing, as well as new noxious weed infestations, through use of herbicides and/or biological controls.

Applications of herbicides have the potential to directly affect individual rare plants. Effects to rare plant species as a result of the noxious weed control design features and mitigation measures proposed as part of this project, although difficult to quantify, would likely minimize any indirect, detrimental impacts of noxious weed infestation on rare plant habitat. Any proposed herbicide spraying for noxious weed control would be localized to severely-infested areas or adjacent to existing roads. Any biological control agent release would be limited to specific “predators” for the weed species intended. Severely infested noxious weed areas and areas impacted by roads are currently considered as low suitability habitat for rare plants. No highly suitable habitat for rare plants would be impacted in the long-term. Furthermore, control or containment of noxious weeds has an indirect effect on rare plants by preventing noxious weed spread into otherwise suitable rare plant habitats. Therefore, although herbicide use for the control of noxious weeds has the potential to directly affect individual plants, the predicted, long-term impacts to rare plant species would be ***very low to low***.

Cumulative Effects

Sensitive Species and Forest Species of Concern

The following past activities and events, current and ongoing activities, and reasonably foreseeable actions result in cumulative effects when combined with Alternative 2.

Past Activities and Events

Past wildfires, mining, timber harvest on National Forest System (NFS) lands, as well as road and trail construction or maintenance may have affected rare plants and/or rare plant habitat through ground and vegetation disturbance and canopy removal. Few floristic surveys were conducted on NFS lands before 1990, so the extent of, and an effect on, rare plant populations of older projects is unknown. Timber harvest on National Forest lands after 1990 occurred with protections for rare plants.

Past wildfire suppression in the project area may have increased the risk of severe stand-replacing fires. The proposed treatments would only slightly reduce the current fuel loading, but have the potential to help improve the overall safety of primary road systems on NFS lands (often also emergency ingress/egress routes.)

Timber harvest and residential development on private lands likely affected rare plants and suitable rare plants habitat, although the extent of such effects is unknown.

Current and Ongoing Activities

Road, trail and heli-spot maintenance, as well as noxious weed treatment activities associated with roads occur in areas with low suitability as rare plant habitat. Therefore, cumulative effects to rare plants or suitable habitat resulting from these maintenance activities within the project area are expected to be ***low to moderate***.

Timber harvest and residential development on private lands may continue to impact rare plants and suitable rare plant habitat, but the effects of such activities are unknown.

Reasonably Foreseeable Actions

Noxious weed treatment and monitoring would follow guidelines established in the Bonners Ferry Noxious Weed Management EIS (USDA 1995), the Sandpoint Ranger District Noxious Weeds Control Project EIS (USDA 1998), and the Priest Lake Noxious Weed Control EIS (USDA 1997), as well as those designed in the NZRS project proposal design features/mitigation measures. Effects to rare plant species and their habitat were analyzed within each District's Weeds Control EIS regarding treatments along specified roads. Effects to rare plant species as a result of the noxious weed control design features and mitigation measures proposed as part of this project would have similar results and are described above. Severely infested noxious weed areas and areas impacted by roads are considered as low suitability habitat for rare plants. No suitable habitat for rare plants would be impacted in the long-term. Furthermore, control or containment of noxious weeds has an indirect effect on rare plants by preventing noxious weed spread into otherwise suitable rare plant habitats. Therefore, although herbicide use for the control of noxious weeds has the potential to directly affect individual plants, cumulative impacts to rare plant species would be ***very low to low***.

Determination of Cumulative Effects Resulting from Alternative 2 (Preferred Alternative)

Sensitive Plants and Forest Species of Concern

When combined with and considering the above past, present, and reasonably foreseeable activities, as well as the Design Features described on pages 14 and 15 of this document, Alternative 2 would have ***very low to moderate*** cumulative effects to rare plants and/or suitable habitat within the moist forest, wet forest, dry forest, cold forest, and subalpine habitat guilds.

Effects Specific to Alternative 3— Road Maintenance with Utilization, No Roadside Salvage

This alternative was developed for consideration based on public comments that expressed concerns about the possible detrimental impacts on wildlife, fisheries, hydrologic, soils and other resources that could result from salvage-logging dead standing, down and live standing hazard trees located within 200 feet of included road shoulders, even with equipment required to stay on the roads.

As with Alternative 2, the same 632 miles of open road segments are being proposed for road maintenance. Under this alternative, road maintenance activities would be authorized, however unlike Alternative 1, the "No Action Alternative, Alternative 3 would allow for utilization of forest products resulting as by-products of the road maintenance work. However, no roadside salvage activities would take place. Roadside salvage of dead, down and hazard trees would have to be authorized under separate multiple NEPA decisions in the future.

This section describes the predicted effects to rare plants specifically resulting from implementation of Alternative 3. Essentially, the effects analyzed as part of Alternative 3 are a combination of the existing management strategies for roads (Alternative 1- No Action) combined with utilization of woody materials produced by clearing (brushing/sawing) existing road prisms.

Direct and Indirect Effects

Sensitive Plants and Forest Species of Concern

Direct effects to some rare plant species in the project area would continue to occur from implementation of Alternative 3, resulting from road maintenance activities. Those species which prefer moist forest habitat and can tolerate compacted soils, light to moderate disturbance, and some sunlight (for example, *Botrychium minganense*, *B. lanceolatum*, and *B. pinnatum*) will continue to incur some negative effects to individuals as a result of existing road maintenance activities already directed under Forest Service management. Effects to rare plants associated with road maintenance include irregular, but sometimes significant, soil displacement, as well as slight changes to forest canopy cover, as woody shrubs, saplings, and trees are cleared within the road prism. These activities, especially soil displacement, have the potential to destroy individual rare plants or small populations. Therefore, the expected effects of road maintenance activities on moist forest, wet forest, cold forest, and subalpine habitat guild rare plant species would likely be ***very low to low.*** However, these activities are not expected to result in trending any sensitive species towards a loss of population viability.

As discussed and required under Alternative 2, "critically imperiled" sensitive species, such as two, new documented occurrences of *B. pedunculosum* on road prisms would be buffered from

project activities to promote a source of continued breeding success and genetic diversity adjacent to suitable habitat. Therefore, expected effects to this specific species would likely be ***moderate***.

Individual, broad-leaved rare plants occurring on road prisms within any habitat guild could also be directly affected by ongoing noxious weed control measures (as prescribed by each District's Noxious Weed management policy), which often include broad-leaf herbicide applications.

Indirectly, some rare plant individuals could also be adversely impacted through noxious weed introduction or spread and the resultant competition with weeds.

Beyond road maintenance and associated activities, the other primary activity described in Alternative 3 is utilization of woody materials that were slashed or cleared as a result of road maintenance work. The act of removing this material only differs from existing management policy in that some organic matter, as well as potential shade (that slash material on the ground provides to small plant lifeforms) will be reduced within the maintained road prism. Because the habitat within road prisms is already degraded, such minor changes in organic matter recruitment to the soil profile or canopy cover for understory plants would likely have negligible effects on rare plants or their habitat, especially when considering the impaired or degraded habitat of the road prism. Therefore, the expected effects of such activities on rare plant habitat or rare plant individuals surviving within the road prism would be ***very low***.

Cumulative Effects

Sensitive Plants and Forest Species of Concern

When combined with the following past, current and ongoing activities and events, Alternative 3 has potential cumulative effects to rare plants that differ from those of the No Action alternative and the other action Alternatives.

Past Activities and Events

Past wildfires, mining, timber harvest on National Forest System (NFS) lands, as well as road and trail construction or maintenance may have affected rare plants and/or rare plant habitat through ground and vegetation disturbance and canopy removal. Few floristic surveys were conducted on NFS lands before 1990, so the extent of, and an effect on, rare plant populations of older projects is unknown. Timber harvest on National Forest lands after 1990 occurred with protections for rare plants.

Past wildfire suppression in the project area may have increased the risk of severe stand-replacing fires.

Timber harvest and residential development on private lands likely affected rare plants and suitable rare plants habitat, although the extent of such effects is unknown.

Current and Ongoing Activities

Road, trail and heli-spot maintenance, as well as noxious weed treatment activities associated with roads occur in areas with low suitability as rare plant habitat. Therefore, cumulative effects to rare plants or suitable habitat resulting from these maintenance activities within the project area are expected to be ***low to moderate***.

Timber harvest and residential development on private lands may continue to impact rare plants and suitable rare plant habitat, but the effects of such activities are unknown.

Reasonably Foreseeable Actions

Noxious weed treatment and monitoring would follow guidelines established in the Bonners Ferry Noxious Weed Management EIS (USDA 1995), the Sandpoint Ranger District Noxious Weeds Control Project EIS (USDA 1998), and the Priest Lake Noxious Weed Control EIS (USDA 1997), as well as those designed in the NZRS project proposal design features/mitigation measures. Effects to rare plant species were analyzed within each District's Weeds Control EIS regarding treatments along specified roads. Effects to rare plant species as a result of the noxious weed control design features and mitigation measures proposed as part of this project would have similar results and are described above. Severely infested noxious weed areas and areas impacted by roads are considered as low suitability habitat for rare plants. No suitable habitat for rare plants would be impacted in the long-term. Furthermore, control or containment of noxious weeds has an indirect effect on rare plants by preventing noxious weed spread into otherwise suitable rare plant habitats. Therefore, although herbicide use for the control of noxious weeds has the potential to directly affect individual plants, cumulative impacts to rare plant species would be ***very low to low***.

Determination of Cumulative Effects Resulting from Alternative 3 (No Roadside Salvage Alternative)

Sensitive Plants and Forest Species of Concern

When combined with and considering the above past, present, and reasonably foreseeable activities, as well as the Design Features described on pages 14 and 15, Alternative 3 would likely result in ***very low to low*** cumulative effects to rare plants and/or suitable habitat within the moist forest, wet forest, dry forest, cold forest, and subalpine habitat guilds, with the exception of one species. Stalked moonwort (*Botrychium pedunculosum*) has the potential to incur ***moderate*** cumulative effects as a result of Alternative 3 when combined with other past, present, and reasonably foreseeable future activities.

Effects Specific to Alternative 4- Roadside Salvage, Road Maintenance with Limited Utilization

This alternative was developed for consideration in the event that the deciding officer feels that the current road maintenance policy should be kept intact, but roadside salvage opportunities in the relatively low-impact project area would help further contribute to the project purpose and need.

Under Alternative 4, only roadside salvage of dead standing, down and live hazard trees within 200 feet of road shoulders would be proposed, if not otherwise excluded by design criteria. The roadside salvage would occur on the same 430 miles of open road segments proposed for treatment in Alternative 2. However, unlike Alternative 2, Alternative 4 would not include extended utilization of woody materials produced through road maintenance/clearing activities. Road maintenance work would continue under the current policy that does not allow for utilization of forest products except for portions of trees that may have naturally fallen on road surface.

Direct and Indirect Effects

Sensitive Plants and Forest Species of Concern

Within Alternative 4 proposed activities, most of the moist forest habitat identified in the coarse filter assessment and during surveys tended to have marginal to moderate potential to support rare plants (specifically *Botrychium spp.*). However, some highly suitable moist habitat within proposed roadside salvage activity areas does exist, and either individual rare plants or their habitat may incur direct effects of soil displacement through the action of winching or pulling logs to the roads.

Many of the rare plant occurrences found during surveys for the project are in fact within the road prisms proposed for road maintenance activities. Even when roads intersect otherwise suitable habitat for rare plants, the roads themselves are not considered highly suitable habitat. Rather, due to the already degraded conditions and potential for recurring disturbance caused by road use and maintenance, road prisms are considered unsuitable or marginally-suitable for rare plants. Most rare plant occurrences found within the road prism occur on the cut slope, ditchline, or shoulder of the roads. The primary species observed within road prisms during surveys for the NZRS project include *Blechnum spicant* **(deer fern)**, *Botrychium lanceolatum* **(lance-leaved or triangle moonwort)** and *B. minganense* **(Mingan moonwort)**, all three of which are listed as S3 sensitive species in the state of Idaho. An S3 ranking means that the plant is considered "uncommon or rare, but not imperiled" (IDFG-CDC 2011.) In the case of deerfern, the road cutbanks often have intersected subsurface water, creating small seeps and human-created habitat for this coastal disjunct species. Past research on the Idaho Panhandle National Forests (IPNF) has shown that both lance-leaved and Mingan moonworts favor moist soils and can tolerate light to moderate disturbance and more open canopies (sun exposure) than many other moonwort species (Evans and Associates 2005b). Therefore, it is not uncommon to find lance-leaved and Mingan moonworts on road prisms within our moist or wet forest habitat guilds. A few individuals of *B. pinnatum* **(northern moonwort)** and *Lycopodium dendroideum* **(ground pine)** also were documented in similar habitats within road prisms during surveys for the NZRS project, and both species are currently listed as S2 species in the state of Idaho. In the cases of these two species, individuals were also found outside of the road prism and the localized populations were considered fairly stable. Where these five species occur on road prisms, individuals will not necessarily be buffered from road maintenance activities. Therefore, NZRS project activities may directly or indirectly affect individuals, as well as marginally-suitable habitat, and may result in low to moderate effects to these species.

Two small populations of *Botrychium pedunculosum* **(stalked moonwort)** were also located within road prisms planned for activities during surveys for this project. Stalked moonwort is classified as an S1 species in the state of Idaho, indicating the species occurs in five or fewer known populations in the state and may be critically imperiled. As a result, these occurrences will be buffered from all project activities (except where to do so would jeopardize public safety.) By protecting these known occurrences, especially where they occur adjacent to suitable habitat off of the road prism, the individuals may continue to provide a source of breeding stock and genetic diversity, which will help promote population maintenance or expansion. Therefore, site-specific buffering will help to reduce the direct and indirect effects of the proposed activity on the stalked moonwort.

No occurrences of **clustered lady's slipper** (*Cypripedium fasciculatum*) were found in any proposed activity areas, and only marginally-suitable habitat for this species was identified. No direct, indirect or cumulative impacts to this species would occur.

Although suitable dry forest habitat occurs scattered throughout the NZRS project area, no sensitive species that occur within the dry forest habitat guild were located. Four new occurrences of *Orobanche pinorum* **(pine broomrape)** were located during surveys for this project, one meta-population of which was quite extensive and encompassed several dozen individuals. Pine broomrape is currently classified as an S2 species in Idaho, but is not currently considered sensitive by the Regional Forester due to its broad global range and distribution. The IPNF currently tracks this species, as a Forest Species of Concern (FSOC), within the dry forest habitat guild. The impacts of the proposed treatments to suitable habitat for this species cannot be predicted with certainty because the species' ecology is poorly understood. However, the proposed treatments would likely result in scattered, dispersed, soil displacement (due to winching of logs to the road prism), as well as small decreases in forest canopy cover as individual trees or snags are felled. Such low levels of disturbance may actually enhance oceanspray, which is the preferred host species for pine broomrape. Oceanspray is considered to be well adapted to disturbance by fire, usually responding to a low-intensity burn by root crown and rhizome sprouting (Young 1983). All of these new pine broomrape occurrences were found outside of the road prism, within areas proposed for salvage of dead trees or logs and live, hazard trees. Because the expected level of disturbance resulting from the proposed salvage activities is dispersed and considered to be low, site-specific buffers around individual pine broomrape ramets will not be imposed.

Alternative 4 may have the potential indirect effect of increasing noxious weed spread, primarily along and adjacent to roads. The extent and degree of potential weed spread is difficult to quantify; however, the NZRS Weeds Report discloses the expected effects of the project on noxious weeds. Noxious weed spread can indirectly affect some rare plants by infesting and/or dominating suitable habitat, particularly of dry forest habitats (which tend to have more open forest canopies and are more conducive to noxious weed establishment and growth.) Effects resulting from noxious weed infestation in suitable habitat for moist or wet forest rare plant species would be expected to be short-term, until forest canopy cover begins to recover/increase following proposed treatments. When forest canopy cover recovers (to approximately 40-50%, based on personal observation), weeds have less competitive advantage and begin to subside in a forest stand.

Due to the potential for the project activities (such as roadside salvage and road maintenance) to indirectly increase weed spread, the NZRS Weed Report also describes required “Mitigation Measures” to reduce noxious weed infestations and spread. Some mitigation measures include reducing the potential for new weed infestations (through pre-treatment of equipment, roads, and road construction materials), monitoring treatment areas, and reducing existing, as well as new noxious weed infestations, through use of herbicides and/or biological controls.

Applications of herbicides have the potential to directly affect individual rare plants. Effects to rare plant species as a result of the noxious weed control design features and mitigation measures proposed as part of this project, although difficult to quantify, would likely minimize any indirect, detrimental impacts of noxious weed infestation on rare plant habitat. Any proposed herbicide spraying for noxious weed control would be localized to severely-infested areas or adjacent to existing roads. Any biological control agent release would be limited to specific “predators” for the weed species intended. Severely infested noxious weed areas and areas impacted by roads are currently considered as low suitability habitat for rare plants. No highly suitable habitat for rare plants would be impacted in the long-term. Furthermore, control or containment of noxious weeds has an indirect effect on rare plants by preventing noxious weed spread into otherwise suitable rare plant habitats. Therefore, although herbicide use for the control of noxious weeds

has the potential to directly affect individual plants, the predicted, long-term impacts to rare plant species would be ***very low to low***.

Cumulative Effects

Sensitive Species and Forest Species of Concern

The following past activities and events, current and ongoing activities, and reasonably foreseeable actions result in cumulative effects when combined with Alternative 4.

Past Activities and Events

Past wildfires, mining, timber harvest on National Forest System (NFS) lands, as well as road and trail construction or maintenance may have affected rare plants and/or rare plant habitat through ground and vegetation disturbance and canopy removal. Few floristic surveys were conducted on NFS lands before 1990, so the extent of, and an effect on, rare plant populations of older projects is unknown. Timber harvest on National Forest lands after 1990 occurred with protections for rare plants.

Past wildfire suppression in the project area may have increased the risk of severe stand-replacing fires. The proposed treatments would only slightly reduce the current fuel loading, but have the potential to help improve the overall safety of primary road systems on NFS lands (often also emergency ingress/egress routes.)

Timber harvest and residential development on private lands likely affected rare plants and suitable rare plants habitat, although the extent of such effects is unknown.

Current and Ongoing Activities

Road, trail and heli-spot maintenance, as well as noxious weed treatment activities associated with roads occur in areas with low suitability as rare plant habitat. Therefore, cumulative effects to rare plants or suitable habitat resulting from these maintenance activities within the project area are expected to be ***low to moderate***.

Timber harvest and residential development on private lands may continue to impact rare plants and suitable rare plant habitat, but the effects of such activities are unknown.

Reasonably Foreseeable Actions

Noxious weed treatment and monitoring would follow guidelines established in the Bonners Ferry Noxious Weed Management EIS (USDA 1995), the Sandpoint Ranger District Noxious Weeds Control Project EIS (USDA 1998), and the Priest Lake Noxious Weed Control EIS (USDA 1997), as well as those designed in the NZRS project proposal design features/mitigation measures. Effects to rare plant species and their habitat were analyzed within each District's Weeds Control EIS regarding treatments along specified roads. Effects to rare plant species as a result of the noxious weed control design features and mitigation measures proposed as part of this project would have similar results and are described above. Severely infested noxious weed areas and areas impacted by roads are considered as low suitability habitat for rare plants. No suitable habitat for rare plants would be impacted in the long-term. Furthermore, control or containment of noxious weeds has an indirect effect on rare plants by preventing noxious weed spread into otherwise suitable rare plant habitats. Therefore, although herbicide use for the control of noxious weeds has the potential to directly affect individual plants, cumulative impacts to rare plant species would be ***very low to low***.

Determination of Cumulative Effects Resulting from Alternative 4 (Roadside Salvage, Road Maintenance with Limited Utilization)

Sensitive Plants and Forest Species of Concern

When combined with and considering the above past, present, and reasonably foreseeable activities, as well as the Design Features described on pages 14-15 of this document, Alternative 4 would have ***very low to moderate*** cumulative effects to rare plants and/or suitable habitat within the moist forest, wet forest, dry forest, cold forest, and subalpine habitat guilds.

Compliance with the Forest Plan and Other Regulatory Direction

A Forest Plan management goal is to "manage habitat to maintain populations of identified sensitive species of animals and plants" (Forest Plan, II-1). The 2007-2009 Forest Plan Monitoring Report (USDA 2010) describes current monitoring and survey accomplishments related to rare plant species. A Forest Plan standard for sensitive species is to "manage the habitat of species listed in the Regional Sensitive Species List to prevent further declines in populations which could lead to federal listing under the Endangered Species Act" (Forest Plan, II-28). This standard meets the requirements of the National Forest Management Act (NFMA) of 1976, Section 6(g)(3)(B), by providing for diversity of plant communities based on the suitability and capability of the specific land area.

The Forest Plan also identifies the need to "determine the status and distribution of threatened, endangered and rare (sensitive) plants on the IPNF" (Forest Plan, II-18). All action alternatives would meet Forest Plan direction and provide for the viability of populations.

Across the Forest, suitable habitat for sensitive plant species appears to be well distributed. Approximately 705,000 acres have been identified as having the potential to support sensitive plant species in a wide array of plant communities. To date, approximately 122,003 acres (about 17 percent) of suitable habitat has been surveyed for sensitive plants.

In 1998, sensitive species trends across the Forest were qualitatively assessed (USDA 1998, pp. 112-116). Of the sensitive plant species assessed, 11 species were considered to have fairly secure populations with stable trends and few observed threats; 28 species had mostly stable populations with some concerns and threats; and for 16 species there was a serious concern. Estimates for this assessment were based on the best information available, including known population size, distribution and threats.

The trends for sensitive moonworts ranged from stable (*Botrychium lanceolatum* ssp. *lanceolatum* [S.G. Gmelin] Angstrom) to serious concerns for population and habitat decline over time (*B. montanum* W.H. Wagner). The trend for clustered lady's slipper (*Cypripedium fasciculatum* Kell.) was characterized as being a serious concern for population and habitat decline over time.

Since implementation of the Forest Plan in 1987, impacts to highly suitable habitat for many sensitive plant species have diminished with the implementation of laws and policies protecting riparian areas, wetland and peatland habitats and policies designed to maintain old growth forests.

A conservation assessment for sensitive moonworts in the IPNF has been prepared (Evans and Associates 2005a), and a conservation strategy for sensitive moonworts in the IPNF has also been completed (Evans and Associates 2005b.) For clustered lady's slipper, where proposed activities in the IPNF may impact the species, formal monitoring plots have been established (USDA 2003). A conservation strategy for the species in the Northern Region has been prepared (Lichthardt 2003).

At the project level, and in accordance with Forest Service Manual (FSM) 2672.1-2672.43 and NFMA Section 6(g)(3)(E)(ii), suitable habitat has been identified and surveyed and the appropriate level of analysis conducted. All documented rare plant occurrences and their contiguous habitat would be buffered from all project activities under the action alternative. Proposed activities under the action alternative are consistent with management recommendations

in the conservation strategy for clustered lady's slipper (Lichthardt 2003). Protection measures for the documented moonwort occurrences are consistent with the most current scientific literature (Johnson-Groh and Farrar 2003).

There are no federally listed threatened or endangered species suspected to occur in Bonner or Boundary Counties in Idaho (USDI 2009), where the project occurs. Therefore, the project is consistent with the Endangered Species Act (1973) as amended.

References

Allen, Michael F. 1991. The ecology of mycorrhizae. Cambridge University Press. Cambridge, U.K.

Bursik, Robert J. and Robert K. Moseley. 1992. Forty-year changes at Hager Lake Fen. Idaho Conservation Data Center. Boise, Idaho. December, 1992.

Crane, M. F. and William C. Fischer. 1986. Fire ecology of the forest habitat types of central Idaho. General Technical Report INT-218. USDA Forest Service Intermountain Research Station. Ogden, UT. 85 pp. *In:* Fire Effects Information System. Species profile for oceanspray (*Holodiscus discolor*). Online at http://www.fs.fed.us/database/feis/plants/shrub/holdis/all.html.

Ellis, Mark W.; Ronald J. Taylor and Richy Harrod. 1999. The reproductive biology and host specificity of *Orobanche pinorum* Geyer (Orobanchaceae). *In:* Madrono. (46)1:7-12.

Evans, David and Associates. 2005. Conservation assessment of eleven sensitive moonworts (Ophioglossaceae; *Botrychium* subgenus *Botrychium*) on the Idaho Panhandle National Forests. Spokane, Washington.

Hammet, Anna E. 1991-2007. Personal observations of the NZ Botanist (1991-2008) concerning earliest emergence and latest spore maturity of sensitive moonworts (*Botrychium* subgenus *Botrychium*) during 17 years of rare plant surveys and monitoring on the Kaniksu portion of the Idaho Panhandle National Forests.

Hitchcock, C. Leo, Arthur Cronquist, Marion Ownbey and J. W. Thompson. 1959. Vascular Plants of the Pacific Northwest. Part 4: Ericaceae through Campanulaceae. University of Washington Press. Seattle, WA. Page 432.

IDFG-CDC. 2010. Idaho Department of Fish and Game- Conservation Data Center. Element Occurrence Records contained in an electronic database. Boise, Idaho.

IDFG-CDC. 2011 Idaho Department of Fish and Game- Conservation Data Center. Website; Heritage Ranks.

Johnson-Groh, C. L., and D. R. Farrar. 1989. [Abstract] Ecological monitoring of *Botrychium campestre* and a new species of *Botrychium* in western Minnesota. Unpublished report on file at: Idaho Department of Fish and Game, Conservation Data Center, Boise, ID.

Johnson-Groh, C. L., and D. R. Farrar. 1993. Population dynamics of prairie moonworts (*Botrychium* subgenus *Botrychium*) in Iowa and Minnesota (abstract). American Journal of Botany 80 (supplement): 109. *In:* Evans, David and Associates. 2005. Conservation assessment of eleven sensitive moonworts (Ophioglossaceae; *Botrychium* subgenus *Botrychium*) on the Idaho Panhandle National Forests. Spokane, Washington.

Johnson-Groh, C.L., and D.R. Farrar. 1996. [Abstract] Effects of leaf loss on moonwort ferns, *Botrychium* subgenus *Botrychium*. American Journal of Botany 83(Supple.): 127.

Johnson-Groh, C.L., and D.R. Farrar. 2003. *Botrychium* inventory and monitoring technical guide. Revised draft. Unpublished. 37pp.

Lichthardt, Juanita. 2003. Conservation strategy for clustered lady's-slipper orchid (*Cypripedium fasciculatum*) in US Forest Service Region 1. Idaho Conservation Data Center. Boise, ID.

Lichthardt, Juanita. 2004. Conservation strategy for Idaho Panhandle peatlands. Idaho Conservation Data Center. Boise, ID.

Lux, David. 2006. Personal communication between fire management officer and NZ Botanist, Betsy Hammet (1991-2008) concerning the timing of spring burns.

Peck, J.H., C.J. Peck, D. R. Farrar. 1990. Influences of life history attributes on formation of local and distant fern populations. *In:* American Fern Journal 80(4): 126-142.

USDA Forest Service. 1987. Idaho Panhandle National Forests Forest Plan. Coeur d'Alene, Idaho.

USDA Forest Service. 1995. Bonners Ferry Noxious Weed Control Project Environmental Impact Statement. Idaho Panhandle National Forests, Bonners Ferry Ranger District. Available at the district office.

USDA Forest Service 1997. Priest Lake Ranger District Noxious Weed Control Project Environmental Impact Statement. Idaho Panhandle National Forests, Priest Lake Ranger District. Available at the district office.

USDA Forest Service. 1998a. Idaho Panhandle National Forests Forest Plan Monitoring and Evaluation Report. Coeur d'Alene, ID.

USDA Forest Service. 1998b. Sandpoint Noxious Weed Control Project Environmental Impact Statement. Idaho Panhandle National Forests, Sandpoint Ranger District. Available at the district office.

USDA Forest Service. 2003a. Idaho Panhandle National Forests Forest Plan Monitoring and Evaluation Report. Coeur d'Alene, ID.

USDA Forest Service. 2003b. Species Conservation Strategy and Monitor Plan for *Blechnum spicant* in Northern Idaho. Idaho Panhandle National Forests. Available at the district office.

USDA Forest Service. 2004. Idaho Panhandle National Forests Forest Plan Monitoring and Evaluation Report. Coeur d'Alene, ID.

USDA Forest Service. 2010. 2007-2009 Idaho Panhandle National Forests Forest Plan Monitoring and Evaluation Report. Coeur d'Alene, ID.

USDI Fish and Wildlife Service. 2010. Idaho's Endangered, Threatened, Proposed, and Candidate Species (With Associated Proposed and Critical Habitats) Under the Jurisdiction of the Fish and Wildlife Service. December 13, 2010

Weldon, L.; A.B. Bail and C. R. Graham. 2001. Conservation strategy for *Botrychium pumicola* (pumice grape fern) on the Deschutes, Fremont and Winema National Forests and Prineville District, Bureau of Land Management. Oregon. 22pp.

Young, Richard P. 1983. Fire as a vegetation management tool in rangelands of the Intermountain Region. *In:* Monsen, Stephen B; Shaw, Nancy, compilers. Managing Intermountain rangelands - improvement of range and wildlife habitats: Proceedings; 1981 September 15-17; Twin Falls, ID; 1982 June 22-24; Elko, NV. General Technical Report INT-

157. USDA Forest Service Intermountain Forest and Range Experiment Station. Ogden, UT. pp. 18-31. *In:* Fire Effects Information System, species profile for oceanspray (*Holodiscus discolor*), online database at http://www.fs.fed.us/database/feis/plants/shrub/holdis/all.html.

Rare Plant – Appendix A

(Kaniksu Rare Plant List & Associated Habitat Guild Descriptions)

Status and Species	Common Name	Rare Plant Guild
Threatened*		
Howellia aquatilis (Kootenai County)	water howellia	Aquatic
Silene spaldingii (Kootenai County)	Spalding's catchfly	Dry Forest (grassland inclusion)
Sensitive**		
Andromeda polifolia	bog rosemary	Peatland
Asplenium trichomanes ssp. *trichomanes*	maidenhair spleenwort	Rock seeps in Moist / Wet Forest
Symphytotrichum boreale (Aster junciformis)	rush aster	Peatland
Astragalus microcystis	least bladdery milkvetch	Dry Forest
Betula pumila v. *glandulifera*	dwarf birch	Peatland / Deciduous Riparian
Blechnum spicant	deerfern	Wet Forest / Moist Forest
Botrychium ascendens	upswept moonwort	Wet Forest
Botrychium crenulatum	dainty moonwort	Wet Forest
Botrychium lanceolatum	triangle moonwort	Wet Forest / Moist Forest
Botrychium lineare	linear-leaved moonwort	Moist Forest/ Wet Forest
Botrychium minganense	Mingan moonwort	Wet Forest / Moist Forest
Botrychium montanum	western goblin	Wet Forest
Botrychium paradoxum	peculiar moonwort	Wet Forest / Moist Forest
Botrychium pedunculosum	stalked moonwort	Wet Forest
Botrychium pinnatum	northwestern moonwort	Wet Forest / Moist Forest
Botrychium simplex	least moonwort	Wet Forest / Moist Forest
Buxbaumia aphylla	leafless bug-on-a-stick	Subalpine
Buxbaumia viridis	green bug-on-a-stick	Wet Forest
Carex buxbaumii	Buxbaum's sedge	Peatland
Carex chordorrhiza	string-root sedge	Peatland
Carex comosa	bristly sedge	Peatland
Carex flava	yellow sedge	Peatland
Carex leptalea	bristle-stalked sedge	Peatland
Carex livida	pale sedge	Peatland
Carex magellanica ssp. *irrigua (C. paupercula)*	poor sedge	Peatland
Cicuta bulbifera	bulb-bearing water hemlock	Aquatic / Peatland
Cypripedium fasciculatum	clustered lady's slipper	Moist Forest / Dry Forest
Cypripedium parviflorum v. *pubescens*	yellow lady's slipper	Peatland / Deciduous Riparian
Drosera intermedia	spoon-leaved sundew	Peatland
Dryopteris cristata	crested shield fern	Peatland
Epilobium palustre	swamp willow-weed	Peatland
Epipactis gigantea	giant helleborine	Peatland / Seeps
Eriophorum viridicarinatum	green-keeled cotton grass	Peatland
Gaultheria hispidula	creeping snowberry	Wet Forest / Peatland
Grimmia brittoniae	Britton's dry rock moss	Moist Forest/ Dry Forest (calcareous rock substrate)
Hookeria lucens	clear moss	Wet Forest
Hypericum majus	large Canadian St. John's wort	Peatland
Iris versicolor	blue flag iris	Peatland

Status and Species	Common Name	Rare Plant Guild
Lycopodiella inundata	northern bog clubmoss	Peatland
Lycopodium dendroideum	ground pine	Wet/ Moist/ Cold Forest / Deciduous Riparian
Meesia longiseta	meesia	Peatland
Phegopteris connectilis	northern beechfern	Wet Forest
Pinus albicaulis	Whitebark pine	Subalpine
Polystichum braunii	Braun's holly fern	Wet Forest
Rhizomnium nudum	naked mnium	Wet Forest
Rhynchospora alba	white beakrush	Peatland
Salix candida	hoary willow	Peatland / Deciduous Riparian
Salix pedicellaris	bog willow	Peatland
Scheuchzeria palustris	pod grass	Peatland
Schoenoplectus subterminalis (Scirpus subterminalis)	water clubrush	Aquatic
Sphagnum mendocinum	Mendocine peatmoss	Peatland
Streptopus streptopoides	krushea	Wet Forest / Cold Forest
Triantha occidentalis ssp brevistyla	short-styled sticky Tofieldia	Peatland
Trichophorum alpinum (Scirpus hudsonianus)	Hudson's bay bulrush	Peatland
Trientalis europaea (T. arctica)	northern starflower	Peatland
Vaccinium oxycoccos	bog cranberry	Peatland
Forest Species of Concern* **		
Arnica alpina var. tomentosa	alpine arnica	Subalpine
Botrychium lunaria	moonwort	Wet Forest
Botrychium "michiganense"	Michigan moonwort	Mesic to dry meadows
Cetraria sepincola	bog birch lichen	Peatland
Cladonia bellidiflora	toy soldiers	We t forest
Collema curtisporum	short-spored jelly lichen	Deciduous Riparian
Diphasiastrum sitchense	Sitka clubmoss	Subalpine / Cold Forest
Ivesia tweedyi	Tweedy's ivesia	Subalpine
Lobaria scrobiculata	textured lungwort	Rock cliffs in Dry Forest
Maianthemum dilatatum	beadruby	Peatland
Muhlenbergia glomerata	marsh muhly	Peatland
Orobanche pinorum	pine broomrape	Dry Forest
Oxalis trilliifolia	trillium-leaved wood-sorrel	Wet Forest
Pentagramma triangularis	goldback fern	Wet Forest
Petasites sagittatus	arrowleaf coltsfoot	Peatland
Pilophorus clavatus	tapered matchstick	Wet Forest
Romanzoffia sitchensis	Sitka mistmaiden	Subalpine
Rubus spectabilis	salmonberry	Wet Forest
Tripterocladium leucocladulum	tripterocladium moss	Moist / Dry Forest (granite to basalt rock substrates)
Ulota megalospora	large spore ulota moss	Wet Forest
Viola selkirkii	Selkirk's violet	Wet Forest

** based on US Fish and Wildlife Service Threatened, Endangered, and Candidate Updated Forest-wide Species List FWS, dated December 13, 2010*

*** based on Northern Regional Forester's Sensitive Species List, January 2011, amended 12/2011*

**** As directed by the Species of Concern Protocol (Region One Planning Peer Group, Task Group 19, March 1997), species of concern are considered to be secure at the global, Regional and state levels, but may be at risk at the Forest planning level.*

HABITAT GUILD DESCRIPTIONS

Subalpine Guild: Includes certain plant communities found at high elevation sites, generally above about 5,000 feet, mostly on ridges, subalpine parklands (subalpine grass and sedge communities), exposed rock outcrops and the following harsh, high elevation communities:

- *Abies lasiocarpa* (subalpine fir) krummholtz
- *Abies lasiocarpa / Rhododendron albiflorum* (subalpine fir/ white rhododendron)
- *Salix commutata* (undergreen willow)
- *Abies lasiocarpa / Vaccinium scoparium* (subalpine fir/ grouse whortleberry)
- *Abies lasiocarpa / Luzula hitchcockii* (subalpine fir/ smooth woodrush)
- *Larix lyallii* (subalpine larch) / *Pinus albicaulis* (whitebark pine)

It also includes the harshest (cold and dry) phases of *Abies lasiocarpa* / *Menziesia ferruginea* (subalpine fir / menziesia) and *Abies lasiocarpa / Xerophyllum tenax* (subalpine fir / beargrass) plant communities. Rare species found in this guild include *Pinus albicaulis* (whitebark pine) and *Buxbaumia aphylla* (leafless bug-on-a-stick moss).

Cold Forest Guild: Includes the more productive and mesic phases of *Abies lasiocarpa* / *Menziesia ferruginea* (subalpine fir/ menziesia) and *Abies lasiocarpa/Xerophyllum tenax* (subalpine fir/ beargrass) community types, mostly above 4,800 feet; however, they can occur below 4,800 feet in cold, north-facing drainages. Sensitive species found in this guild are *Cetraria subalpina* (Iceland-moss lichen) and sometimes *Lycopodium dendroideum* (groundpine); the Forest species of concern *Diphasiastrum sitchense* (Sitka clubmoss) also occurs on this guild. This includes cold riparian areas that can extend well below 4,000 feet and are dominated by cold and wet *Abies lasiocarpa / Calamagrostis canadensis* (subalpine fir / bluejoint reedgrass) and *Abies lasiocarpa / Streptopus amplexifolius* (subalpine fir/ twisted stalk) communities. These cold riparian communities can also contain a mosaic of peatland communities and species, and a few rare species generally found in warmer western hemlock communities, such as *Streptopus streptopoides* (krushea).

Wet Forest Guild: This guild is found in wet, generally riparian, often mid- to late-successional western redcedar and western hemlock plant communities, including most identified 'ancient cedar groves' found scattered throughout the northern sub basins, generally at less than 4,000 feet. Certain plant communities within these systems, including *Thuja plicata / Oplopanax horridum* (cedar/ devil's club), *Thuja plicata* / *Athyrium filix-femina* (cedar/ ladyfern), *Thuja plicata* / *Adiantum aleuticum* (cedar/ maidenhair fern), *Tsuga heterophylla* / *Gymnocarpium dryopteris* (western hemlock/ oakfern) and *Thuja plicata* / *Gymnocarpium dryopteris* (cedar/ oakfern), have a high potential to support rare plants. Many species within this guild are rare coastal disjuncts such as *Blechnum spicant* (deerfern), *Hookeria lucens* (clear moss), *Platanthera (Habenaria) orbiculata* (round-leaved orchid), and *Polystichum braunii* (Braun's sword fern). Clear moss is associated with seeps and "boggy" areas in wet cedar forests. The sensitive species *Buxbaumia viridis* (green bug-on-a-stick moss) is found in this guild on decomposing cedar logs.

Other rare species are boreal disjuncts or boreal peripherals such as *Streptopus streptopoides* (krushea), *Phegopteris connectilis* (northern beech fern) and *Lycopodium dendroideum* (groundpine). Certain scattered rare species like the *Botrychium* species (moonworts), especially *Botrychium montanum* (western goblin), *B. minganense* (Mingan moonwort), *B. pedunculosum* (stalked moonwort), *B. paradoxum* and *B. ascendens* (upswept moonwort) occur in these communities on riparian benches or other shallow-sloped microsites. *Asplenium trichomanes* (maidenhair spleenwort) can be found in wet, rock seeps in wet forest guild habitats. Wet forest communities can also contain, or intergrade into, peatland communities such that Peatland Guild species and

Wet Forest Guild species can overlap across the landscape. Some of the Wet Forest Guild species can also be found in Moist Forest Guild habitats.

Moist Forest Guild: This guild is found in moist *Thuja plicata* (western redcedar) and *Tsuga heterophylla* (western hemlock) plant communities, generally in mid- to late-successional stages below 4,800 feet. A few species can also be found in moist *Abies grandis / Asarum caudatum* (grand fir / ginger) and *Abies grandis / Clintonia uniflora* (grand fir / queencup beadlily) communities. Certain members of the Wet Forest Guild can also be found in these more mesic upland plant communities. This guild contains the following plant communities: *Tsuga heterophylla / Asarum caudatum* (hemlock/ wild ginger), *T. heterophylla / A. caudatum - Aralia nudicaulis* (hemlock/ ginger - wild sarsaparilla), *T. heterophylla / Clintonia uniflora* (hemlock / beadlily), *T. heterophylla / C. uniflora - Aralia nudicaulis* (hemlock / beadlily - wild sarsaparilla), *T. heterophylla / C. uniflora - Menziesia ferruginea* (hemlock / beadlily - fool's huckleberry), *Thuja plicata / Asarum caudatum* (cedar/ ginger) and *Thuja plicata / Clintonia uniflora* (cedar/ beadlily). Some rare species occur in small, moist microsites within these mesic communities, like *Asplenium trichomanes* (maidenhair spleenwort), which is found on seepy rock outcrops. Rare and uncommon plant species such as the coastal disjuncts *Blechnum spicant* (deerfern) and *Platanthera (Habenaria) orbiculata* (round-leaved orchid) are found in moist forest habitats. Rare *Botrychium* species (moonworts), especially *Botrychium minganense* (Mingan moonwort), *B. lanceolatum* (triangle moonwort) and *B. pinnatum* (northwestern moonwort), can be found in shallow-sloped microsites. The boreal species *Lycopodium dendroideum* (ground pine) can also occur in these more mesic communities.

Dry Forest Guild: This guild encompasses dry, open sites in *Pinus ponderosa* (ponderosa pine), *Pseudotsuga menziesii / Physocarpus malvaceus* (Douglas-fir / ninebark), *P. menziesii / Calamagrostis rubescens - Arctostaphylos uva-ursi* (Douglas-fir / pinegrass - kinnikinnick) and *P. menziesii / Festuca idahoensis* (Douglas-fir / Idaho fescue) or */ Agropyron spicatum* [*Elymus spicata*] (bluebunch wheatgrass) communities, generally below 4,500 feet. *Astragalus microcystis* (least bladdery milkvetch), the only sensitive species of this guild to occur in the Kaniksu zone, is found on rock cliffs above Lake Pend Oreille and on gravelly banks above the Pend Oreille River. *Platanthera orbiculata* (round-leaved rein orchid), a Forest species of concern, may be found in Douglas-fir / ninebark habitats.

Deciduous Riparian: Broad-leaved deciduous forests occur on islands and margins of lowland major rivers in the Kaniksu zone such as the Kootenai, lower Clark Fork, Pend Oreille and lower Priest rivers, and along the shores of Pend Oreille Lake and Priest Lake. These forests are most commonly dominated by *Populus trichocarpa* (black cottonwood), with lesser amounts of introduced *P. deltoides* (plains cottonwood) and escaped hybrid poplars (*Populus trichocarpa* X ?), which were planted for streambank stability. Cottonwood communities often are adjacent to shrub-carr communities and can form an indistinguishable mosaic. *Collema curtisporum* (short-spored jelly lichen) is a rare coastal disjunct lichen found on large diameter black cottonwood.

Stands of *Populus tremuloides* (quaking aspen) are also present and associated with higher gradient streams or moist seeps. *P. tremuloides* (quaking aspen), *Betula papyrifera* (paper birch) and *Betula occidentalis* (water birch) also occur as secondary components in lowland conifer-dominated forests throughout northern Idaho. *Alnus rubra* (red alder) is an uncommon but sometimes locally abundant coastal disjunct. It can be a codominant in moist forests in lower elevation riparian zones and meadow margins along Lake Pend Oreille and the lower Priest River in the Kaniksu zone, as well as in Coeur d'Alene Lake, the lower Coeur d'Alene River and the lower St. Joe River. It is also found in patches in drainages in the Little North Fork of the Clearwater River.

Aquatic Guild: This guild occurs generally in littoral (< 2 meters) zones of vernal pools, small ponds and lakes throughout northern Idaho, generally at lower elevations. *Potamogeton natans* (floating-leaved pondweed), *Myriophyllum* species (water-milfoil), *Utricularia* species

(bladderworts), and other *Potamogeton* species occur alone or in combination in shallow littoral zones. *Nuphar polysepalum* (yellow pond lily) and *Brasenia shreberi* (water-shield) are frequently present as monocultures in deeper littoral zones. *Potamogeton amplifolius* (large-leaved pondweed), *Potamogeton praelongus* (white- stalked pondweed), and *Potamogeton richardsonii* (Richardson's pondweed) are common in deep limnetic zones (> 2 meters) of many northern Idaho lakes.

The rare species *Cicuta bulbifera* (bulb-bearing water hemlock) and *Scirpus subterminalis* (water clubrush) are members of the aquatic guild. A single population of the rare *Nymphaea tetragona var. liebergii* (pygmy waterlily) was historically known from Granite Lake and is believed to be extinct in Idaho. The listed threatened species *Howellia aquatilis* (water howellia) was historically known to occur in the Pend Oreille sub basin and has also likely been extirpated. Only one other population is known in Idaho near Harvard, along the Palouse River; however, populations occur to the west in Spokane County, Washington. No other populations have been found to date in northern Idaho, even though high quality habitat exists.

Peatland Guild: Peatlands by definition are habitats whose soil substrate is composed of organic material, where deposition of organic material exceeds decomposition. In north Idaho, peatland habitats are found mostly in the northern three subbasins (Priest, Kootenai and Pend Oreille). This guild can be divided into five distinct sub-guilds, each containing different plant communities and species, substrates, pH and abiotic processes:

- *poor fen*
- *intermediate/rich fen*
- *ombrotrophic bog*
- *paludified forest*
- *shrub carr*

Poor fens occur in glacial scours, kettle holes, isolated oxbows, old lake beds, and at or near the heads of drainages where inflow is limited. Thick layers of *Sphagnum* peat have accumulated since the end of continental glaciation, about 6,000 - 7,000 years ago. Poor fens are minerotrophic, receiving nutrients from water percolating through mineral soil or bedrock, and are quite acidic (pH values 4-6). These communities are characterized by a solid mat of *Sphagnum* moss with scattered stems of vascular plants, including rare plants such as *Carex comosa* (bristly sedge) and *Carex chordorrhiza* (string-root sedge). Poor fens support the oldest plant communities in northern Idaho and have changed little since the end of glaciation 6,000-7,000 years ago (Bursik and Moseley 1995; Moseley 1998). These communities are often erroneously referred to as 'bogs', especially when they occur on floating mats in seepage lakes.

Ombrotrophic bog ('true bog') communities occur in glacial scours, kettle holes, isolated oxbows, old lake beds, and at or near the heads of drainages where inflow is limited. Unlike poor fens, the thick mats of peat accumulate upwards forming hummocks, often at the base of shrubs or downed logs, and are above the influence of the water table. Incoming water and nutrients (from precipitation) are held above the water table, primarily by the low hydraulic conductivity of the *Sphagnum* peat. Vascular species are few or absent and are restricted to those tolerant of acidic conditions (poor fen species). Rare plants like *Andromeda polifolia* (bog rosemary), *Carex chordorrhiza* (string-root sedge), *Gaultheria hispidula* (creeping snowberry), *Rhynchospora alba* (white beak rush) and *Vaccinium oxycoccos* (bog cranberry) are adapted to these harsh environments. The pH values are very acidic, ranging from pH 3- pH 4. Compared to rich fens (pH 6 - 7.5) the pH difference is equal to the difference between vinegar and salt water (Crum 1992).

Intermediate and rich fens are *Sphagnum*-poor peatlands with vascular plants contributing the majority of cover and composition. Most people usually refer to these communities as marshes,

wet meadows or swamps. Fen soils are organic, usually with little to no decomposition of organic material, while true marshes have mineral soils and usually high rates of decomposition. Intermediate fens have equal dominance by bryophytes (*Sphagnum* species and true mosses) and vascular plant species, especially sedges, while rich fens have few (if any) *Sphagnum* species present. Organic soils of rich fens are formed by accumulation of sedge, grass and brown moss peat (*Aulacomnium* and *Calliergon* species). *Carex utriculata* (beaked sedge), *Carex lasiocarpa* (slender sedge), *Carex aquatilis* (water sedge), *Scirpus microcarpus* (small-fruited bulrush), *Typha latifolia* (cattails), *Calamagrostis canadensis* (bluejoint reedgrass), *Spiraea douglasii* (hardhack), *Betula glandulosa,* (bog birch) and willow (*Salix* species)-dominated community types may occur as rich fens.

Rich fens in subalpine habitat are characterized by *Carex scopulorum* (Holm's mountain sedge), *Carex aquatilis* (water sedge), *Calamagrostis canadensis* (bluejoint reedgrass), *Deschampsia cespitosa* (tufted hairgrass), *Kalmia microphylla* (bog laurel) and *Betula glandulosa* (bog birch). Several rare species are found in rich fens, including *Carex leptalea* (bristle-stalked sedge), *Carex paupercula* (poor sedge) and *Trientalis arctica* (northern starflower). Rich fens are the most floristically diverse of the peatland types. Like poor fens, intermediate and rich fen communities can occur on floating or fixed organic mats. Floating mats contain some of the most ecologically stable communities occurring in north Idaho peatlands because they adjust to fluctuating water levels annually, maintaining constant contact with water and never becoming inundated like fixed (shore) mats. The pH values for intermediate and rich fens can vary from pH 6 - 7.5.

Paludified forests typically occur on the margins of closed peatland basins and often form a mosaic with poor fen, rich fen, or shrub-carr communities. These communities occur with the expansion of peatlands and result from a rise in the water table from peat accumulation. Paludification is thought to precede the formation of poor fen and true bog (ombrotrophic) habitats (Crum 1992). Paludified forests are characterized by an overstory of conifers, usually *Pinus contorta* (lodgepole pine) and *P. monticola* (white pine), with lesser amounts of *Abies lasiocarpa* (subalpine fir), *A. grandis* (grand fir), *Picea engelmannii* (Engelmann spruce), *Thuja plicata* (western redcedar) or *Tsuga heterophylla* (western hemlock), with a soil that is *Sphagnum* peat. The understory is dominated by *Sphagnum* moss species and some vascular plants, including some rare species found in poor fens and ombrotrophic bogs. One species, *Maianthemum dilatatum* (beadruby) occurs in a paludified forest in northern Idaho; it is the only known population of the species in Idaho.

Shrub-carr habitats include moist shrubland riparian communities. Habitats dominated by willows and other shrubs occur in nearly impenetrable patches along low gradient channels, as stringers or on narrow flood plains along high gradient streams, as mosaic patches within riparian forests, and on margins of meadows and fen communities. Most commonly, one or more shrubs dominate vast areas of moist to wet, seasonally flooded fens or riparian zones. Shrub-carrs often contain willow-dominated shrub lands associated with low gradient meandering channels or fens, and are characterized by *Salix drummondiana* (Drummond's willow) with lesser amounts of or codominance by *Salix geyeriana* (Geyer's willow) and *S. sitchensis* (Sitka willow); they may also contain *S. bebbiana* var. *bebbiana* (Bebb's willow), *Spiraea douglasii* (hardhack), *Alnus incana* (thinleaf alder), or *Betula glandulosa* (bog birch) community types. The rare willows *Salix candida* (hoary willow) and *Salix pedicellaris* (bog willow) can be found in shrub-carrs and in shrub/ fen mosaics. *Betula pumila* (dwarf birch), a rare species in northern Idaho, can be found in shrub-carrs in the Moyie and Kootenai river systems. One rare lichen, *Cetraria sepincola* (bog-birch lichen), is found exclusively on the branches of bog and dwarf birches. Rare hybrids between *Betula pumila* (dwarf birch) and *Betula glandulosa* (bog birch) - known as *Betula X sargentii* - occur in the Priest River drainage (Johnson 1995).

Willows are frequently absent or a minor component of shrub lands associated with higher gradient streams. *Alnus incana* (thinleaf alder), *Alnus sinuata* (Sitka alder), *Cornus sericea* (red-

osier dogwood) and *Rhamnus alnifolia* (alder buckthorn) occur as community dominants along higher gradient streams. Patches of *Cornus sericea* (red-osier dogwood), *Salix bebbiana* var. *bebbiana* (Bebb's willow), *Crataegus douglasii* (Douglas hawthorn) and *Crataegus suksdorfii* (Suksdorf's hawthorn) are common in association with cottonwood forests on larger stream systems. *Crataegus columbiana* (Columbia hawthorn) is only found in warm, lower elevation drainages like the St. Joe, Coeur d'Alene, Kootenai and lower Pend Oreille. Channel bars are frequently vegetated with *Salix exigua* (coyote willow). Rare plant species found in shrub-carr communities include *Cypripedium parviflorum* (yellow lady's slipper), *Carex leptalea* (bristle-stalked sedge), *Carex paupercula* (poor sedge), *Dryopteris cristata* (crested shield-fern), *Lycopodium dendroideum* (groundpine), *Petasites sagittatus* (arrowleaf coltsfoot) and *Gaultheria hispidula* (creeping snowberry). Rare *Botrychium* species (moonworts) can also be found on the margins of these communities.